Corrib Onshore Pipeline Oral Hearing

Brief of Evidence

Pipeline Integrity
John Purvis

1. My name is John Purvis and I am Principal Pipeline Engineer for Shell UK Limited. I am responsible for ensuring that Shell pipelines are operated and maintained safely throughout their service life.

Qualifications and Experience

I am a Chartered Engineer (Institution of Mechanical Engineers) and hold B.Sc. and Ph.D. degrees. I have 36 years industrial experience of which some 28 years have been with Shell. Most of my career has been working in pipeline engineering with assignments in research and development, engineering appraisal and design, project management and safety engineering.
I have previously served as an industrial and national representative on both national and international pipeline standard committees.

Knowledge of the Corrib Onshore Pipeline Project

2. I have provided the Corrib project with technical advice on integrity management of the pipeline system. I am working to put in place the inspection and maintenance activities required for pipeline operation. In my role as the Principal Pipeline Engineer, the introduction of first gas into the Corrib pipeline system will require my formal authorisation.

Scope of Evidence

Today my brief of evidence will cover the following areas

1. Context and Overall Assessment of Corrib Onshore pipeline
2. Corrib Onshore Pipeline System Overview
3. Pipeline Design
4. Pipeline Operation, Maintenance and Integrity Management

Context and Overall Assessment

3. My evidence today will focus on how the safety of the Corrib Onshore Pipeline is guaranteed by the rigorous application of integrity management to the system. The statement describes how potential hazards associated with Upsteam Gas transportation are managed and made safe or mitigated by the design, construction, operation and maintenance activities, which are applied to the pipeline.

4. Every pipeline system which transports hydrocarbons – oil, gas, wet gas and condensate - needs to be designed, built, operated and maintained to the highest industry standards and measures must be in place to eliminate, control or mitigate any potential hazards to ensure its integrity.

There is extensive experience within both the industry and among SEPIL staff members in safely operating these pipelines. The Corrib onshore pipeline has been the subject of a detailed independent safety review (Advantica - Independent Safety Review of the Onshore Section of the Proposed Corrib Gas Pipeline', Report Number R8391, 17 January 2006) from which the Technical Advisory Group (TAG) - appointed by the then Minister for Communications, Marine and Natural Resources - made a number of recommendations. These recommendations further increased the safety factors applied to the pipeline and have been adopted by the Corrib project.

Implementation of the Pipeline Integrity Management Scheme known as (PIMS) will provide a system for safeguarding the integrity of the Corrib Gas Pipeline System and ensure its availability for safe operations.

Corrib Onshore Pipeline

System Overview

5. The Corrib field will produce gas consisting of some 97% methane and ethane vapour with small amounts of liquids. These liquids mainly consist of condensed water from the gas in the reservoir which is saturated with water vapour, formation water which exists as free water at the base of gas bearing rocks and gradually rises up the reservoir as the gas is depleted, condensate – liquid hydrocarbons (similar to diesel) and the injected chemicals - methanol and corrosion inhibitor.(Section 4 Appendix Q1 'Offshore Pipeline Design Basis and Addendum' Corrib Onshore Pipeline EIS Volume 2). Analysis of well stream 18/25-1 (refer Table 4-6 of Appendix Q1 'Offshore Design Basis' EIS Volume 2) demonstrates that 98.8% (Mole) of this product stream will become the export sales gas after processing by the Bellanaboy Bridge Gas Terminal. The remaining components of the unprocessed product stream consists of 0.35% methanol, 0.8% water and 0.05% condensate. The Corrib reservoir pressure at the wellhead is predicted to decline to less than 144 bar after the first 5 years of operation (Slide 1).

6. The onshore Corrib pipeline system consists of the onshore gas pipeline, services (umbilicals, fibre optic cable and signal cable), water outfall pipeline and the Landfall Valve Installation (LVI). The onshore pipeline system covers a distance of 9.2km from a land fall at Glengad to the Gas Terminal at Bellananboy. A schematic of the route is given in Slide 2. The Landfall Valve Installation will be located approximately 50m from where the pipeline comes ashore. On land, the gas pipeline together with services and outfall pipeline will be laid in a trench with a minimum cover of 1.2m (Slide 3) and where it crosses watercourses and roads it will be installed at a minimum depth of cover of 1.6m.

(Section 4.3.1.1 of Chapter 4, Corrib Onshore Pipeline EIS Volume 1).

At the two bay crossings it is proposed to bundle the elements together within a sleeve (Slide 4)

(Chapter 4, Corrib Onshore Pipeline EIS Volume 1). The bundle will be a minimum of 4 metres below the bed of the bay.

7. Safety of the Corrib Onshore Pipeline is an integral part at every stage of the project development. These include the following stages:

- Design (concept and detailed design)
- Construction (procurement of materials, fabrication and pre-commissioning)

- Operation and maintenance (activities required to convey the gas in a safe and efficient manner including inspection and repair)
- And finally Decommissioning

Design

Design Code

8. The Corrib pipeline has been designed in accordance with the pipeline codes which were endorsed by the Technical Advisory Group (TAG) following the completion of an independent safety review by Advantica. The primary design code specified is I.S. EN 14161 and this code is supplemented by I.S. 328 and PD 8010. I.S. 328 is the primary supplementary code. The requirements of the supplementary codes have been adopted for those specific areas in which they exceed the requirements of I.S. EN 14161.

(Appendix Q4 'Design Code Review – Onshore Pipeline Section' EIS Volume 2).

9. A summary of the key design requirements for the onshore pipeline is given in Slide 5

(Appendix Q2 Onshore Pipeline Design Basis in EIS Volume 2).

The onshore pipeline is made from high strength carbon steel, has a nominal diameter of 20 inches, is externally coated (part of the corrosion protection system) and has a design pressure of 144bar. The 144 bar pressure was selected based on the recommendation in the Advantica Report, which was accepted by SEPIL. The rationale for 144 bar is given in the extract from the report and I quote :

Limiting the pressure in the onshore section to pressures no greater than 144 bar (equivalent to a design factor of 0.3, consistent with the design of pipelines passing through more densely populated suburban areas) is believed to be both practical and an effective measure to reduce risk (and will only be required in the early years of the life of the pipeline because the pressure in the gas wells will decline naturally as gas is extracted). In view of the societal concerns, the level of uncertainty in the risk analysis, the extent of extrapolation of onshore pipeline design codes beyond their normal range of application and mindful that the results of risk analysis are only one factor in the decision-making process, we believe that this measure should be taken and the pipeline design revised accordingly. We recommend that the pressure in the onshore pipeline should be limited to no greater than 144 bar, with a design factor not exceeding 0.3, and the pipeline design revised accordingly.

For design purposes a design life of 30 years has been applied. A field operating life of 20 years is assumed.

Wall Thickness and Test Pressure

10. Applying the design codes, a design pressure of 144 bar, a design factor of 0.3 and a corrosion allowance of 1mm the required wall thickness for the onshore pipeline downstream of the Landfall Valve Installation is less than the 27.1mm wall thickness

of the pipe procured for the Corrib pipeline. After installation, the onshore pipeline will be tested at a pressure of 504 bar for a period of 24 hours. The purpose of this test is to prove the integrity of the constructed onshore pipeline
(Appendix Q9 'Onshore Hydrostatic Pressure Testing Report' Volume 2).

11. The approach described above is very conservative:

- a design factor of 0.3 is normally applied to pipelines in densely populated urban areas
- Under daily operating conditions the pressure in the onshore pipeline operates well below the onshore pipeline design pressure of 144 bar. Pressures at the terminal inlet will be in the range 90-100bar (with a maximum normal operating pressure of 110bar). The process safeguarding scheme is designed for pre-alarms and pre-trips to initiate actions before the onshore pipeline pressure reaches 144 bar. These actions include initially ramping closed the subsea wellhead choke valves and, if the pressure continues to rise, shut in individual wellheads. In addition, the operator at the terminal will have sufficient time to intervene and initiate total shut down.
- The Landfall Valve Installation provides an additional independent and automatic safeguard to prevent the onshore pipeline from experiencing pressure above 144 bar design pressure (Appendix Q3 'LVI Design Review' EIS Volume 2)
- The onshore pipeline will have been already proven to a pressure of 504bar – significantly higher than the 144 bar limit.

Reservoir pressure is predicted to fall quickly over the first years of operations (see Slide 1 shown previously). After approximately 5 years the reservoir pressure at the wellheads is predicted to be less than 144bar. As a consequence of the decline in the reservoir pressure the operating pressure in the onshore pipeline will also decline.

Operating and Transient Pressure

12. In day to day operations (steady state) of the first years of operation, the Corrib pipeline will operate with an inlet pressure into the terminal of 90 -100bar with a maximum normal operating pressure of 110bar.

The gas quality (very low liquid content) and length of the Corrib onshore and offshore pipelines mean that the phenomenon of surge (pressure transients sometimes seen in liquid and multi-phase lines – referred to sometimes as water hammer) is not applicable for the Corrib gas pipelines.

Flow Assurance

13. The transmission of wet gas by pipeline is used in many oil and gas production developments. Slide 6 provides a list of some other onshore wet (raw) gas pipelines - operated by Netherlandse Aardolie Maatschaapij - which were visited as part of a study tour in 2007

(Appendix D (part 1) 'Report on Netherlands Study Tour' EIS Volume 2). The design pressures of these pipelines lie within the range 100 – 274bar.

Hydrate Formation and Prevention

14. Gas hydrate is a crystalline structure, similar to snow, which can form when methane and water are present. Under specific conditions, a hydrate could build up and restrict gas flow in the onshore pipeline. For the Corrib gas pipeline, hydrate formation is prevented by continuous injection of methanol at the well head.

Slugging

15. Slugging may occur when there are changes in the flow conditions in the pipeline which result in variations in the liquid flowrates. In the context of the Corrib onshore pipeline slugging could result in an increase in the rate of liquids arriving at the terminal and not plugs of liquid arriving. This is a production flow problem rather than a safety one. A 'slug catcher' (a series of large pipes) at the receiving Terminal accommodates these liquid surges should they occur.

Erosion

16. Internal erosion of the steel pipeline wall is not expected to be a problem for the onshore Corrib gas pipeline. High velocities in a gas pipeline can be the cause of erosion. For the Corrib pipeline gas velocities are of the order 7m/s. This is below the range at which erosion could occur – the typical threshold gas velocity for carbon steel with corrosion inhibition is 20m/s - for stainless steels the threshold limit is typically 80m/s. Sand production is not predicted from the reservoir. However, as a prudent operator, a subsea acoustic sand detector has been installed on the subsea manifold. (Section A3.3 of Appendix Q5 'Pipeline Integrity Management Scheme' Corrib Onshore Pipeline EIS Volume 2).

Internal Corrosion

17. Metals can react with various chemicals, often dissolved in water, to form metal compounds. The resulting loss of metal is corrosion and this corrosive attack can be uniform or localised in the form of pitting. 'Wet' corrosion of the pipeline can occur due to exposure to the produced fluids (internal corrosion) or factors such as exposure to the atmosphere, sea or soil (external corrosion).

18. The main internal corrosion threat for the Corrib pipeline system is carbon dioxide ($CO2$) corrosion. Detailed studies of the potential for corrosion in the Corrib pipeline show that the corrosion rates for the onshore pipeline are very low even without the benefit of inhibition. The Corrib pipeline system will be treated with corrosion inhibitor and methanol. These chemicals will be injected at the offshore wellheads via the umbilicals. The inhibitor protects the pipe wall against the corrosive fluids while the methanol is miscible with the corrosive water and so will further reduce the corrosivity in the onshore pipeline. Predicted initial corrosion rates are significantly less than 0.05mm/yr and decline as the operating pressure in the pipeline declines over time. The equipment and monitoring system, which will be installed at the Bellanaboy gas terminal, will ensure that the corrosion inhibitor is continuously applied. To allow for any residual corrosion and unexpected upsets in the corrosion inhibition delivery system a corrosion allowance of 1mm has been incorporated into the design of the onshore pipeline.
(Appendix Q6 'Corrib Pipeline: Internal Corrosion Rate Assessment' EIS Volume 2).

19. At the LVI location internal corrosion in the by-pass piping will be eliminated by the use of corrosion resistant alloy in the main line section and duplex stainless steel in the 16 inch loop pipework. (Appendix Q3 'Landfall Valve Installation Design Overview' EIS Volume 2).

External corrosion

20. For the onshore pipeline the threat of external corrosion is eliminated by the use of external coatings and cathodic protection. The coatings consist of a three layer polypropylene coating which provides mechanical protection from stones, etc. The cathodic protection is of the impressed current type which is widely used throughout the industry. This system works by applying a low negative voltage to the pipeline which, in the event of a defect in the coating, acts to reverse the normal chemical reaction and so prevents corrosion products forming.

Pipeline Stability and Peat slide analysis

21. On the sections of the onshore pipeline which will be constructed in areas of blanket bog, a stone road will be constructed within which the pipeline will be laid. Once installed the stone road will remain in place and act as a permanent support and protection for the pipeline. The stone road will be covered with a layer of peat. Detailed analysis has confirmed the stability of the stone road in the peat and of the peat itself in this area Appendix M2 'Peat Stability Assessment' and Appendix M3 'Geotechnical Assessment of Stone Road Construction in Peat Area' Corrib Onshore Pipeline EIS Volume 2). Regular pipeline patrols will verify that there are no signs of settlement or slip and monitoring of pipeline position will make use of GPS plates.

Services

Umbilicals, Fibre Optic Cable (FOC), Electrical Signal Cable

22. The umbilicals deliver three fluids: product methanol containing corrosion inhibitor for the pipeline, aqueous ethylene glycol based hydraulic fluid to power actuated valves at the wellheads and subsea manifold, treated produced water from the terminal to be disposed at the subsea manifold.

Onshore the umbilicals will be laid 1m away from the gas pipeline. At the bay crossings, the umbilicals are included within the sleeved bundle. The umbilicals are made from corrosion resistant material and sheathed in polyethylene to eliminate internal and external corrosion.

(Appendix Q2 'Onshore Pipeline Design Basis' and Tables A5.1 – 5.3 in Appendix Q5 'Pipeline Integrity Management Scheme' EIS Volume 2).

During construction the Fibre Optic Cable and Electrical Signal Cable will be installed in the same trench as the 20 inch onshore gas pipeline and umbilicals.

Outfall Pipeline

23. The onshore section of the outfall pipe is manufactured from high density polyethylene and will carry treated surface water runoff from the gas terminal.

(Appendix A6 within Appendix Q5 'Pipeline Integrity Management Scheme' EIS Volume 2).

Landfall Valve Installation (LVI)

24. The Landfall Valve Installation (LVI) is designed to prevent the onshore section of the Corrib pipeline from experiencing an internal pressure greater than 144bar and so provides a specification break between the onshore and offshore pipelines. (Figure 4-1 in Appendix Q3 'Landfall Valve Installation Design Overview' Corrib Onshore Pipeline EIS Volume 2).

Pipeline Operation, Maintenance and Integrity Management

25. On completion of pipeline construction and testing, the pipeline will be handed over to SEPIL Operations Manager. The introduction of first hydrocarbon gas into the pipeline system requires formal acceptance to confirm that all key safety and integrity requirements have been met and this will be documented by a hand-over certificate signed by the SEPIL Operations Manager and the Principal Pipeline Engineer. The availability of operating procedures and emergency response plan are examples of these requirements.

Safe operation of the pipeline system is through its design and the operation and maintenance of the system in accordance with the design requirements.

Pipeline Integrity Management Scheme (PIMS)

26. The PIMS (Appendix Q5, Pipeline Integrity Management Scheme, Onshore Corrib Pipeline EIS Volume 2) essentially describes 'the who, the what and the how' that is needed to safeguard the integrity of the Corrib pipeline and to ensure its continuing safe operation. . The PIMS considers:

- process safety (e.g. operating procedures, overpressure protection, emergency procedures and leak detection)
- Mechanical integrity (e.g. fatigue, overstress, mechanical damage, geotechnical instability, corrosion management)
- Management of change (e.g. design change, variation to operational procedures)

27. The PIMS provides a summary of the roles and responsibilities of the SEPIL Operations Manager, Pipeline Competent Person and Integrity Focal Points in the context of the safe operation of the pipeline system. The SEPIL Operations Manager is responsible for implementing the safeguarding of the technical integrity of the Corrib pipeline system and he/ she achieves this by ensuring that there are sufficient resources (people, services, materials) to operated the pipeline system in accordance with the design intent. The Pipeline Competent Person provides the SEPIL Operations Manager with technical support in the following main areas:

- Development of an inspection and maintenance scheme for the pipeline system
- Assessment of the technical integrity of the pipeline system, using the findings from the inspection, monitoring and testing programme

- Preparation and monthly reporting of the inspection and maintenance programme execution and pipeline integrity status
- Preparation and issue of an annual integrity report to the Operations Manager, Asset Owner and CEO of SEPIL
- Co-ordination, monitoring and control across the various areas which contribute to the assurance of pipeline integrity
- Technical authority for the management of the pipeline activities. These include review and acceptance/ rejection of any deviations which may arise from the design requirements, and approval of any intervention activities
- Review and approval of emergency response procedures
- Provision of specific subsea inspection services for the offshore gas pipeline

28. One part of the scheme is a summary of the risks and the risk 'barriers'. The other part, Integrity Reference Plan, provides a catalogue of activities necessary to assure the ongoing integrity of the pipeline system. As appropriate, activity items will be included as work items in the pipeline inspection plans. The detailed inspection and maintenance procedures and plans are being finalised as the project moves through construction to commissioning of the pipeline.

Integrity Control Activities

29. The activity plan gives details of the hazards, barriers and monitoring requirements which provide assurance that the measures being taken are working and effective in maintaining the integrity of the pipeline system throughout its operating life. Some of these hazards have already been mentioned in the previous section on design. The principal hazards and control measures for the onshore pipeline are:

Internal Corrosion

30. On-line real time corrosion monitoring equipment will be used to confirm that the corrosion inhibition is effective. This includes the use of an offshore corrosion monitoring spool that allows the measurement of corrosion rate around the circumference of the pipeline, together with ultrasonic measurement mats and corrosion probes at the terminal. This monitoring equipment will identify any significant upsets to the corrosion mitigation system as well as providing long term corrosion rate information.

The produced fluids will also be sampled and analysed and these data will be used by the pipeline corrosion engineer to model corrosion rates, and compare these with the available measurements. Any areas requiring remedial action and improvement will be highlighted at the quarterly corrosion expert group review. These issues will also be communicated to the SEPIL Operations Manager at the monthly integrity review meetings.

31. Pigs are devices, which can be inserted into and travel throughout the length of the pipeline driven by the flow of the contents. For the Corrib gas pipeline, routine pigging is not required for normal operation. However, the lines will be pigged for specific operations (e.g. commissioning, intelligent pigging).

32. An intelligent pig (IP) run is planned prior to production in order to provide a base signature for future IP inspections. Analysis of the IP data will give wall thickness and other feature information along the entire length of the pipeline. The frequency of intelligent pigging is based upon the results of the annual integrity assessment.

External Corrosion

33. Routine and specialist inspection of the cathodic protection system (CP) will be carried out as recommended by I.S. 328:2003 section 11.3.7. The onshore pipeline will be tested at least every 6 months. The result will be recorded to ensure that the pipe to soil potentials are within the specified limits and to identify any significant changes. Checks on the transformer rectifier outputs will done monthly and, at the same time the additional pipe/ soil potentials will be checked and recorded at either side of the insulation flange (at the Terminal end), adjacent to transformer and rectifier installation and at the mid-point between these two.

Other additional checks include close interval potential surveys (cips) to test the level of cathodic protection along the pipeline and direct current voltage gradient (DCVG) checks to test for coating defects. These checks will be done within the first two years of operation and at regular intervals thereafter.

Mechanical Damage

34. For onshore pipelines the most common hazard is external damage by accidental interference. The thick wall of the gas pipeline makes it resistant to damage from most agricultural and earth moving equipment. The most common damage is to the pipeline coating system as a result of accidental impact. The residual risk of damage by accidental interference will be mitigated by line patrols every 2 weeks, the use of marker posts above the pipeline at field boundaries and the presence of brightly coloured plastic marker tape placed about 300mm (1 foot) above the buried pipeline and umbilicals. The LVI location will be visually inspected by operations staff on a weekly basis. The LVI safety shutdown valves will be tested at an interval no greater than every twelve months.

35. SEPIL staff will liaise regularly with landowners regarding the pipeline system, and provide advice on the pipeline location and safe working.

Fatigue

36. The pipeline system has been designed in such a way that failure due to fatigue is not a credible failure mechanism. However, significant pressure fluctuations, if any, will be monitored, recorded and verified.

Brittle Fracture

37. The materials used in the system have been selected to operate at the lowest temperatures expected during operations. For the first 1100m of the buried onshore section, the pipeline material is suitable for temperatures down to –20degC. The remainder of the pipeline to the Terminal is suitable for temperatures down to –10degC. The valves at the Landfall Valve Installation are specified for low temperature brittle service down to –26 degC and the 16inch/ 4inch shutdown / restart

spools down to –26DegC. These properties together with system operating procedures ensure that failure due to brittle fracture is not a concern.

(Section A3.3 of Appendix Q5 'Pipeline Integrity Management Scheme'

EIS Volume 2)

Overstress

38. Overstress due to internal pressure, soil and peat stability has been addressed in the design section – essentially the threat has been eliminated by design.

39. The valves in the LVI and onshore pipeline system will be tested on a regular basis.

Integrity Reference Plan and Action

40. The results of the inspection, monitoring and control activities will be recorded and assessed to determine trends and identify any areas, which may require prompt remedial action.

41. An annual integrity report for the pipeline will be prepared and any remedial actions included in the Integrity Reference Plan of the pipeline. The report will be signed off by the SEPIL Asset Leader and Operations Manager. The report is then presented to the CEO of SEPIL.

Emergency Response Plan

42. An Emergency Response Plan is being developed in cooperation with the local and regional emergency services The procedures will be in place before commissioning of the pipeline and the main objectives and elements of the plan will be discussed with the local community. The plan will include:

- Responsibilities and organisation;
- Notification procedures and communications in the event of an incident;
- Alerting and communication procedures;
- Procedures for shutting down the pipeline(s);
- Emergency actions to be taken; and
- Reporting.

43. An outline summary of the key elements of the emergency response responsibilities and actions is given below:

<u>Raising the alarm</u>

- It is expected pipeline emergencies will be reported via several sources: members of the public, pipeline patrols, Operations and Maintenance Technicians, Emergency services and detection by instrumentation.
- If the leak is reported to the Bellanaboy Bridge Gas Terminal (BBGT) control room, the Control Room Operator will:
  1. Obtain relevant information of the incident.
  2. Advise the control room staff.
  3. Advise the caller the next action to ensure personnel safety

Role of the BBGT Control Room Operator {CRO}

- On confirmation of a leak the Control Room Operator will initiate the emergency response procedures, alert the Incident Response Team (IRT) and Emergency Coordination Team (ECT).
- The Incident Response Team will then be dispatched to the location of the incident.

Role of the Emergency Services

- Emergency services (Gardai, Fire & Rescue and Health Services Executive.) have overall control at the scene of an incident until the area has been made safe after which overall responsibility for the onshore pipeline returns to SEPIL
- SEPIL will liaise with the local authorities and give advice on safety and technical matters.

Role of the "Incident Response Team"(IRT)

- Safety and technical advice support will be provided to the Emergency Services by the SEPIL "Incident Response Team" as required.
- The Incident Response Team will also provide hands-on support where deemed necessary by the Emergency Services. This includes the initiation of the site "Rapid Reach" system which will notify local residents of the incident via the telephone networks.

Role of the SEPIL "Emergency Coordination Team"(ECT)

- The Emergency Coordination Team provides back-up support to the Incident Response Team. The Emergency Coordination Team will also issue communications to the press, the public and regulators as required.

Post incident

Once the area has been made safe and the exclusion zone removed by the local authority, control will be handed back to SEPIL. SEPIL will then carry out an incident investigation and take the necessary reinstatement actions.

Decommissioning

44. A decommissioning plan will be prepared to ensure that the operations will comply with relevant EU and national legislation relevant at the time of decommissioning. This study would include a review of best practice for decommissioning, and will include an environmental appraisal of the proposed decommissioning methods.

Decommissioning of the pipeline after its useful life will involve the removal of any above ground facilities at the LVI and any remaining gas and hydrocarbon residues from the pipeline and services.

45. Decommissioned pipelines are typically left in place, cleaned and monitored according to an agreed programme. Alternatively the pipeline and services may be removed. The umbilicals will be flushed to remove all traces of chemicals and all electrical lines isolated and disconnected. The outfall pipe will be removed, or flushed with clean water. The umbilical and outfall pipe, once isolated, flushed and capped could be left in-situ.

Conclusions

46. We have extensive experience of safely operating these pipelines.

A safe design for the Corrib Onshore Pipeline has been developed.

This takes full account of the nature and pressure of the pipeline contents, the terrain through which the pipeline passes and the presence of the local community.

A comprehensive integrity management scheme has been prepared and as the project moves forward through construction a detailed emergency response plan will be in place before commissioning.

SEPIL are full committed to ensuring that this pipeline will maintained and operated safely throughout its life.

Inspector, that concludes my evidence.